2012 Advanced Environmental Health/Advanced Food Technology Standing Review Panel

Status Review for:

Risk of Adverse Health Effects Due to Alterations in Host-Microorganism Interactions, the Risk of Adverse Health Effects of Exposure to Dust and Volatiles During Exploration of Celestial Bodies, and the Risk of Performance Decrement and Crew Illness Due to an Inadequate Food System

Comments to the Human Research Program, Chief Scientist

I. Overview

The 2012 Advanced Environmental Health/Advanced Food Technology (AEH/AFT) Standing Review Panel (from here on referred to as the SRP) met for a site visit in Houston, TX on November 14 - 15, 2012 to review the Evidence Reports for the Risk of Adverse Health Effects Due to Alterations in Host-Microorganism Interactions and the Risk of Performance Decrement and Crew Illness Due to an Inadequate Food System and to receive a status update on the Risk of Adverse Health Effects Due to Alterations in Host-Microorganism Interactions, the Risk of Adverse Health Effects of Exposure to Dust and Volatiles During Exploration of Celestial Bodies, and the Risk of Performance Decrement and Crew Illness Due to an Inadequate Food System.

The SRP thought that the overview presentation by the Space Human Factors and Habitability Element and the status review presentations by the AEH Project Lead Scientist and the AFT Project Lead Scientist were very well done and informative.

Based on the presentations and the discussion during the meeting, the SRP would like to relay the following information in addition to that included in the Evidence Report to Dr. Kundrot, the HRP Chief Scientist (Acting). These comments should be viewed as detailed supplements to the Evidence Report.

II. Comments for the AEH Project Status Review

The SRP would like to see the preliminary research plan presented by Dr. Mark Ott to be expanded.

The SRP also strongly recommends intensive studies of the effects of the space environment on the human microbiome be done. These studies would enable a better estimation of the degree of microbiological risk to the astronauts.

III. Comments for the AFT Project Status Review

Food Acceptability Studies: The SRP thinks that sensory acceptability panels should be carried out using at least 40 participants (Stone and Sidel, 1993) with more than 50 is desirable.

Evidence of Inadequate Sensory Acceptability During Spaceflight: The SRP thinks that if this

has not been done, a video diary of the individual crew eating and talking to the camera and describing their eating experiences would help to log how appetite changes, food fatigue sets in, what crew members are eating and how they feel at the time. All this can then be evaluated by the NASA researchers who develop a "listening grid" to make a written record of the crewmembers' reaction to the food consumption. It should be combined with other physical tests (blood work, stamina, etc.) to gain an understanding as to how appetite is affected over time. This relates to the nutrients consumed and general health of the crewmembers.

Evidence of Inadequate Acceptability of Food for Exploration Missions-Ground and Spaceflight Research: A shelf stable egg patty has been developed by the Natick Research Labs and improved through a Combat Rations Network (CORANET) Study (Breakfast Components that Include Eggs) that involved a collaboration of the Natick Research Labs and Michigan State University. Thermal processing of the egg product was not necessary because of the "hurdle technology" used which involves a combination of techniques to inhibit pathogen growth (lowering pH, water activity, preservative addition, etc.). Final challenge studies with commercially produced products need to be completed but preliminary challenge tests looked promising.

Residual oxygen in dry foods packaging can be minimized by placing oxygen absorber sachets in the packages, or by incorporation into the packaging material. This is more difficult with dry foods (because some moisture is necessary to catalyze the reaction) but companies such as Multisorb Technologies Inc. (Buffalo, NY) can be used to help resolve this type problem.

If very low temperature storage is possible on missions, reformulation of the food items should be able to help resolve issues of providing sufficient food with sufficient shelf life. However, packaging resistance to the extreme temperatures needs to be assured. This is a very abusive environment and the low temperature could negatively impact resistance to physical inputs such as impact and abrasion. It is likely that some literature exists in this area though testing at these low temperatures is problematic. Sending out a request for Small Business Innovation Research (SBIR) proposals to test and/or develop packaging films and packages that can be effectively used in this low temperature environment may be necessary.

The effects of radiation on foods have been extensively studied in the past. Review of that literature may provide some more insight. Use of antioxidants and possible development of new packaging films might help abate the negative effects of radiation on product quality.

IV. 2012 Advanced Environmental Health/Advanced Food Technology SRP Status Review: Statement of Task for the Risk of Adverse Health Effects Due to Alterations in Host-Microorganism Interactions, the Risk of Adverse Health Effects of Exposure to Dust and Volatiles During Exploration of Celestial Bodies, and the Risk of Performance Decrement and Crew Illness Due to an Inadequate Food System

The 2012 Advanced Environmental Health/Advanced Food Technology (AEH/AFT) Standing Review Panel (SRP) will participate in a Status Review that will occur via a site visit meeting with the Human Research Program (HRP) Chief Scientist, Deputy Chief Scientist and members of the Space Human Factors and Habitability (SHFH) Element. The purpose of this review is for the SRP to:

1. Receive an update by the HRP Chief Scientist or Deputy Chief Scientist on the status of NASA's current and future exploration plans and the impact these will have on the HRP.

2. Receive an update on any changes within the HRP (for example, each of the Elements rewriting their gaps) since the 2011 SRP meeting.

3. Receive an update by the Element or Project Scientist(s) on progress since the 2011 SRP meeting.

4. Participate in a discussion with the HRP Chief Scientist, Deputy Chief Scientist, and the Element regarding possible topics to be addressed at the next SRP meeting

The 2012 AEH/AFT SRP is not required to produce a report from this status review, but the HRP Chief Scientist welcomes any written comments from the SRP within 30 days of the 2012 update. Any comments that the 2012 AEH/AFT SRP provides to the HRP Chief Scientist will be made available to the public on the Human Research Roadmap website (http://humanresearchroadmap.nasa.gov/).

V. 2012 Advanced Environmental Health/Advanced Food Technology Standing Review Panel Roster

Panel Chair

Howard Kipen, M.D., M.P.H.
UMDNJ-Robert Wood Johnson Medical School
Clinical Research and Occupational Medicine Division
Environmental and Occupational Health Sciences Institute
170 Frelinghuysen Road
Piscataway, NJ 08854
Phone: 732-445-0123 x629
Email: kipen@eohsi.rutgers.edu

Panel Members:

Harriet Burge, Ph.D.
EMLab P&K
851 Hayden Avenue
Novato, CA 94945
Phone: 415-246-3381
Email: hburge@umich.edu

Terry Gordon, Ph.D.
New York University School of Medicine
Department of Environmental Medicine
550 First Avenue
New York, NY 10016
Phone: 845-731-3536
Email: terry.gordon@nyumc.org

Janice Harte, Ph.D.
Michigan State University
Department of Food Science & Human Nutrition
Trout Food Science Building
469 Wilson Road, Room. 114
East Lansing, MI 48824
Phone: 517-355-8474 x105
Email: harteja@msu.edu

Dennis Heldman, Ph.D.
The Ohio State University
Department of Food Science & Technology
229 Parker Food Science & Technology Building
2015 Fyffe Road
Columbus, OH 43210
Phone: 614-292-5899
Email: heldman.20@osu.edu

Jeffrey Laskin, Ph.D.
UMDNJ-Robert Wood Johnson Medical School
Division of Toxicology
170 Hoes Lane
Piscataway, NJ 08854
Phone: 732-445-0119
Email: jlaskin@eohsi.rutgers.edu

C. Glen Mayhall, M.D.
University of Texas Medical Branch, Galveston
Department of Internal Medicine
301 University Boulevard
Galveston, TX 77555
Phone: 409-772-3192
Email: cmayhall@utmb.edu

James Pestka, Ph.D.
Michigan State University
Department of Food Science & Human Nutrition
234 Trout Food Science Building
469 Wilson Road
East Lansing, MI 48824
Phone: 517-353-1709
Email: Pestka@msu.edu

Anna Shvedova, Ph.D.
National Institute of Occupational Safety and Health
Pathology and Physiology Research Branch (MS 2015)
1095 Willowdale Road
Morgantown, WV 26505
Phone: 304-285-6177
Email: ats1@cdc.gov